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Risk Factors for Hypertension among Ghanaians: Evidence from Ghana Demographic and Health Survey

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Background: Hypertension is considered an important challenge in public health due to its high risk of cardiovascular disease, kidney disease and death. Despite interventions aimed at reducing the prevalence of hypertension, it still remained as leading cause of stroke and other related diseases and it accounts for 12.8% of all deaths worldwide. The goal of this paper is to explore factors that influences hypertension among men in Ghana. Knowledge of these factors will help public health practitioners provide targeted interventions which will result in a significant reduction of hypertension among Ghanaians.

Methods: Data source is a survey aimed at collecting data on the indicators of the millennium development goals. Hypertension was the main outcome. Socioeconomic status (primary exposure variable) as well as other potential determinants were assessed. Analytic techniques included multiple Poisson regression that assessed the effects of potential covariates on hypertension in a hierarchical manner. Crude and adjusted prevalent rate ratios are reported with their corresponding 95% confidence intervals at 5% level of significance.

Results: The overall prevalence rate of hypertension among Ghanaian men is 8%. Age was found to be a significant predictor of hypertension. Wealth index is also a significant predictor of hypertension with men in levels 4 and 5 more likely to develop hypertension compared to those belonging to level one after adjusting for other covariates. Men with secondary education were 23% more likely to develop hypertension compared to those with higher education, however those with no formal education were 32% less likely to develop hypertension compared to those with higher education after adjusting for other covariates.

After adjusting for other covariates, professionals/technical/managerial workers were 35% more likely to be hypertensive compared to those engaged in farming. Men who visited some health facility within the last six months preceding the study, were more likely to be hypertensive against those who did not visit any health facility within the same period. Hypertension is more prevalent among parents who lost two or more children compared to parents who were not bereaved. After adjusting for confounders, men with two or more lifetime partners were 13% more likely to be hypertensive as against those with only one lifetime partners.

Conclusion: The rate of hypertension among Ghanaians is high. Factors such as age, wealth index, occupation, bereavement and number of lifetime partners are significant predictors of hypertension after adjusting for potential covariates.

Keywords: Hypertension, Adult men, Health Related Factors and Primary Exposure Variables

Introduction

Hypertension is considered an important challenge in public health due to its high risk of cardiovascular disease, kidney disease and death [1,2]. Despite interventions aimed at reducing the prevalence of hypertension, it still remains the leading cause of stroke and other related diseases and it accounts for 12.8% of all deaths worldwide [3]. It has been ranked as the third cause of disability-adjusted life years [4]. In some countries in Africa, hypertension prevalence significantly increased in the absence of effective control measures [5,6].

In Sub-Saharan Africa, most government spend their limited resources in combating communicable diseases such as malaria and tuberculosis. This result in increasing burden of non-communicable diseases such as hypertension because very few people will get treated and hence high morbidity and mortality from preventable consequences such as stroke and myocardial infarction. Hypertension in this region of the continent is considered to be a problem of the urban areas due to their lifestyles.

In a cross sectional survey conducted by Hendriks et al among four rural and urban communities in Sub-Saharan Africa, age was identified as an independent predictor of hypertension in all the communities and more common among the old adult compared to the young adult [7,8]. The study also revealed that respondents in Namibia with lower socioeconomic status had higher blood pressure compared to those with higher socioeconomic status. In Peru, hypertension was more prevalent among less educated compared to the highly educated [7].

Similarly, as reported by Pandit and others in cross sectional study, those who reported lower educational attainment were found to be at greater risk of hypertension as a result of poorer knowledge in controlling blood pressure [9]. Profession was shown to be strong predictor of hypertension as identified in a study conducted in Benin. In the same study, private sector employees, housewives and people on retirement were more likely to have high blood pressure compared to government employees [10].

Household variations also play important roles in determining the prevalence of hypertension. A study conducted by Harburg et al., revealed that people from household with high stress level are more likely to be hypertensive compared to those from low stress household [11]. Hypertension is common among households belonging to low income level status as evident in a study that looked at the role of neighbourhood context in understanding social disparity in hypertension prevalence, awareness, treatment and control. On the contrary, households on the highest quartile of affluence was found to have their blood pressure within the normal range compared to households in lowest quartile level in the same study [12].

The goal of this paper is to explore factors that influences hypertension among men in Ghana. Knowledge of these factors will help public health practitioners provide targeted interventions which will result in a significant reduction of hypertension among the population. It will also add to existing literature on non-communicable diseases.

Methods

Data sources

Ghana Demographic and health survey 2014 (GDHS-2014) is a nationally representative survey that collect data on health indicators of the millennium development goal. The survey followed a two-stage sample design at the national level as well as urban and rural areas across the ten administrative regions in the country. In stage 1, a total of 427 clusters were selected in both urban and rural areas.

In stage 2, a systematic sampling of the household was carried out and a household listing operation was undertaken. About 30 households were randomly selected from each cluster to constitute a total sample size of 12,831 households. The sample is not self-weighting at the national level due to the approximately equal sample sizes in each region. Weighting factors therefore was added to the dataset so that the results at the national level will be proportional.

All men aged 15-59 who stayed in the household a night before the survey or permanent residents were eligible to be interviewed and have their blood pressure measured. Basic demographic information collected include age, sex, marital status and education. The age and sex data obtained in the household questionnaire were used to identify men who were eligible for individual interviews.

Study outcomes

Hypertension (average systolic blood pressure greater than 140mm/Hg and average diastolic blood pressure greater than 90mm/Hg) is the main outcome. In total, 2,607 men aged 25-59 with complete interview responses were included in this study.

Potential risk factors

The outcome variable was assessed independently against all potential risk factors. These risk factors were grouped into socio-demographic and health related factors.

Statistical analysis

"Stata" statistical package version 14.1 was employed in the analysis [13]. Key variables that were regrouped are religion, occupation and ethnic group. Lifetime partners and bereavement were categorized whiles blood pressure was transformed into binary variable (normal or high). Simple and multiple Poisson regression models with robust variance estimator at a 95% confidence interval (CI) was used to obtain Prevalent rate ratios (PRR) [14]. Poisson regression model was preferred to logistic regression model due the study focus (blood pressure status of men), which is a continuous variable. Each of the selected risk factors were assessed independently with the outcome variable in a simple Poisson regression model to obtain the significant variables which were grouped into socio-demographic factors and health related factors. The multiple Poisson regression model considered all the significant risk factors in a hierarchical manner. Two different ways of analysis was considered. The first produced the unadjusted prevalence rate ratios (PRR) followed by adjustment at only factor level and subsequently the hierarchical adjustment. The hierarchical models produced a total of three models for the outcome variable. Model 1 produced the unadjusted prevalent rate ratios (PRR) of socioeconomic status and model 2 produced adjusted prevalent rate ratios (aPRR) with demographic factors as the covariates. Model 3 contained model-2 adjusted with health-related factors. Statistical significance was denoted with an asterisk (*). $p<0.001$, $p<0.01$ were represented by *** and ** respectively, while * denoted $p<0.05$. The risk factors included in the final multivariable Poisson regression model were significant at $p<0.05$ as well those recommended by literature. Akaike Information Criterion (AIC) was ran after each model and presented in table 3 to determine the best fit model. Model 3 was chosen as the best fit model because it had the lowest AIC compared to the remaining models. Collinearity test was carried out on model 3 to establish whether or not there were redundant independent variables included in the model.

Results

Tables 1 and 2 present the sample distribution as indicated by study participants, grouped under demographic and health related variables for weighted and unweighted samples. The weighted distribution is described here

unless otherwise specified. More than quarter of them belong to the upper quintile of the wealth index. Men with no formal education constituted 14.92% whiles the majority (58.13%) had secondary education. Majority of the sampled men were farmers (36.24%) and close to 50% belonged to the Akan ethnic group. Christians constituted more than 70% followed by Muslims (17.52%), no religion (6.77%) and traditionalists (4.73%). The study also showed that about 7% were within the upper age bracket (55-59) with those age 25-29years forming the majority (20.05%). About 78% were not bereaved prior to the survey with the least being 6.37% who lost two or more children. Majority of them have one lifetime partner (91.59%) and less than a quarter of sampled men are registered with the National Health Insurance Scheme (NHIS). Over 80% did not visit any health facility within the last six months prior to the survey and more than 90% do not know their hypertension status. Those who smoke constituted about 6% of the study participants.

Prevalence of hypertension by selected characteristics

Table 3 present the prevalence of hypertension by selected socio-demographic characteristics as well as health related factors.

Multivariable Poisson Regression Analysis

Predictors of hypertension with socio-demographic factors

Wealth index is a significant predictor of hypertension with men in levels 4 and 5 more likely to develop hypertension compared to those belonging to level one after adjusting for other covariates (aPRR=2.17; 95% CI, 1.96-2.40 and aPRR=2.13; 95% CI, 1.94-2.33). Men with secondary education were 23% more likely to develop hypertension compared to those with higher education (aPRR=1.23; 95% CI, 1.15-1.31), however those with no formal education were 32% less likely to develop hypertension compared to those with higher education (aPRR=0.68; 95% CI, 0.61-75) after adjusting for other covariates and these were statistically significant. Crude analysis showed that professionals/technical/managerial workers were 97% more likely to be hypertensive compared to those engaged in farming, however this rate reduced to 35% after adjusting for other covariates (PRR=1.97; 95% CI, 1.89-2.06 and aPRR=1.35; 95% CI, 1.27-1.44). Hypertension was less prevalent among Muslims compared to traditionalists (aPRR=0.67; 95% CI, 0.60-0.75). Men from Gurma ethnic origin were 17% more likely to develop hypertension compared to Mole-dagbani ethnic group (aPRR=1.17; 95% CI, 1.04-1.32) after adjusting for other covariates. Residing in the Volta Region increased the chance of developing hypertension compared to residing in Greater Accra Region (aPRR=1.56; 95% CI, 1.43-1.69) whiles residing in Upper East Region reduced the chance of developing hypertension compared to residing in Greater Accra Region (aPRR=0.27; 95% CI, 0.24-0.31). Also, age significantly predicts hypertension. Men age 30-34 years were 2.72 times more likely to be hypertensive against those in 25-29 age bracket (aPRR=2.72; 95% CI, 2.40-3.08). This rate increased as the age increased to 55-59 years having the highest rate (aPRR=12.98; 95% CI, 11.64-14.48). Except educational level, all the factors were significant predictors of hypertension in the overall adjusted model (Model-3) in Table 3.

Table 1: Distribution of hypertension according to socio-demographic characteristics with their corresponding crude and adjusted prevalence rate ratio (N=2,607)

Characteristics	Unweighted N (%)	Weighted %	Crude PRR (CI)	Adjusted PRR (CI)
Socioeconomic status				
Wealth index				
Poorest	661 (25.35)	16.39	Reference	Reference
Poorer	498 (19.10)	17.10	1.30 (1.20, 1.41)***	0.90 (0.82, 0.98)*
Middle	461 (17.68)	18.48	2.29 (2.13, 2.46)***	1.91 (1.75, 2.07)***
Richer	482 (18.49)	21.24	3.01 (2.82, 3.22)***	2.13 (1.94, 2.33)***
Richest	505 (19.37)	26.78	3.04 (2.84, 3.25)***	2.17 (1.96, 2.40)***
Educational level				
No education	555 (21.29)	14.92	0.39 (0.36, 0.42)***	0.68 (0.61, 0.75)***
Primary	370 (14.19)	12.30	0.59 (0.55, 0.64)***	0.97 (0.89, 1.06)
Secondary	1359 (52.13)	58.13	1.10 (1.04, 1.16)***	1.23 (1.15, 1.31)***
Higher	323 (12.39)	14.65	Reference	Reference
Occupation				
Professional/technical/managerial	641 (24.71)	29.12	1.97 (1.89, 2.06)***	1.35 (1.27, 1.44)***
Agriculture	1174 (45.26)	36.24	Reference	Reference
Manual workers	779 (30.03)	34.64	1.87 (1.78, 1.96)***	1.26 (1.18, 1.34)***
Demographic factors				
Religion				
Orthodox	656 (25.18)	24.47	1.61 (1.45, 1.79)***	0.75 (0.67, 0.84)***
Pentecostal/charismatic	649 (24.91)	29.42	1.46 (1.31, 1.62)***	0.72 (0.64, 0.80)***
Other Christian	385 (14.78)	17.10	1.62 (1.45, 1.81)***	0.73 (0.65, 0.82)***
Islam	539 (20.69)	17.52	1.05 (0.94, 1.18)	0.67 (0.60, 0.75)***
Traditional/spiritualist	201 (7.72)	4.73	Reference	Reference
No religion	175 (6.72)	6.77	1.40 (1.25, 1.58)***	0.78 (0.69, 0.89)***
Ethnicity				
Akan	1033 (39.62)	47.23	2.26 (2.13, 2.38)***	1.02 (0.94, 1.11)
Ga/dangme	183 (7.02)	9.58	2.20 (2.04, 2.37)***	0.93 (0.84, 1.03)
Ewe	314 (12.04)	13.68	1.71 (1.59, 1.85)***	0.70 (0.63, 0.78)***
Mole-dagbani	632 (24.24)	15.41	Reference	Reference
Gurma	180 (6.90)	5.86	1.07 (0.97, 1.19)	1.17 (1.04, 1.32)**
Others	265 (10.16)	8.24	1.33 (1.20, 1.47)***	0.97 (0.88, 1.08)
Region				
Western	303 (11.62)	11.28	0.94 (0.89, 1.00)	1.12 (1.05, 1.20)**
Central	233 (8.94)	9.66	1.03 (0.94, 1.12)	1.26 (1.15, 1.38)***
Greater Accra	301 (11.55)	22.11	Reference	Reference
Volta	207 (7.94)	7.39	0.88 (0.83, 0.94)***	1.56 (1.43, 1.69)***
Eastern	260 (9.97)	9.22	0.59 (0.56, 0.63)***	0.78 (0.73, 0.84)***
Ashanti	270 (10.36)	17.88	1.00 (0.94, 1.05)	1.08 (1.02, 1.16)**
Brong Ahafo	289 (11.09)	8.12	0.67 (0.62, 0.72)***	1.01 (0.92, 1.09)
Northern	311 (11.93)	8.72	0.37 (0.34, 0.40)***	0.88 (0.79, 0.98)*
Upper East	249 (9.55)	3.56	0.12 (0.11, 0.14)***	0.27 (0.24, 0.31)***
Upper West	184 (7.06)	2.07	0.39 (0.36 0.43)***	0.95 (0.85, 1.06)
Age				
25-29	518 (19.87)	20.05	Reference	Reference
30-34	460 (17.64)	18.99	2.72 (2.39, 3.10)***	2.72 (2.40, 3.08)***
35-39	437 (16.76)	16.49	4.41 (3.90, 4.98)***	4.65 (4.13, 5.23)***
40-44	402 (15.42)	15.68	6.46 (5.72, 7.30)***	7.11 (6.31, 8.01)***
45-49	326 (12.50)	11.85	6.58 (5.85, 7.40)***	7.39 (6.58, 8.31)***
50-54	264 (10.13)	9.84	7.70 (6.80, 8.71)***	9.50 (8.39, 10.76)***
55-59	200 (7.67)	7.10	10.2 (9.20, 11.50)***	12.98 (11.64, 14.48)***

Predictors of hypertension with health-related factors

Men who visited some health facility within the last six months preceding the study were more likely to be hypertensive against those who did not visit any health facility within the same period (aPRR=1.09; 95% CI, 1.01-1.18). Both crude and adjusted analysis showed the same prevalent rate ratio, however, the level of significance reduced from p-value<0.005 to p-value<0.05 in the adjusted

analysis. Hypertension is more prevalent among parents who lost two or more children compared to parents who were not bereaved (PRR=1.26; 95% CI, 1.17-1.34). This rate doubled after adjusting for other covariates (aPRR=2.56; 95% CI, 2.29-2.86). This is statistically significant. After adjusting for confounders, men with two or more lifetime partners were 13% more likely to be hypertensive as against those with only one lifetime partners (aPRR=1.13; 95% CI, 0.99-1.29) although this is not significant. Those who registered with NHIS were 19% less likely to develop hypertension compared to those who were not registered (aPRR=0.81; 95% CI, 0.76-0.86). Ever been told of having hypertension increased the chance of developing hypertension compared to never been told (aPRR=3.86; 95% CI, 3.53-4.21). Also, cigarette smoking significantly predict hypertension. Smokers were twice more likely to become hypertensive compared to non-smokers (aPRR=2.00; 95% CI, 1.81-2.22). All the factors are significant predictors of hypertension in the overall adjusted model in Table 3, except total number of lifetime partner.

Table 2: Distribution of hypertension according to health-related variables with their corresponding crude and adjusted prevalence rate ratio (N=2,607)

Characteristics	Unweighted N (%)	Weighted %	Crude PRR (CI)	Adjusted PRR (CI)
Socioeconomic status				
Wealth index				
Poorest	661 (25.35)	16.39	Reference	Reference
Poorer	498 (19.10)	17.10	1.30 (1.20, 1.41)***	2.04 (1.82, 2.29)***
Middle	461 (17.68)	18.48	2.29 (2.13, 2.46)***	2.87 (2.56, 3.23)***
Richer	482 (18.49)	21.24	3.01 (2.82, 3.22)***	3.49 (3.05, 4.01)***
Richest	505 (19.37)	26.78	3.04 (2.84, 3.25)***	4.04 (3.51, 4.66)***
Educational level				
No education	555 (21.29)	14.92	0.39 (0.36, 0.42)***	0.74 (0.63, 0.86)***
Primary	370 (14.19)	12.30	0.59 (0.55, 0.64)***	1.00 (0.87, 1.15)
Secondary	1359 (52.13)	58.13	1.10 (1.04, 1.16)***	1.07 (0.97, 1.18)
Higher	323 (12.39)	14.65	Reference	Reference
Occupation				
Professional/technical/managerial	641 (24.71)	29.12	1.97 (1.89, 2.06)***	1.49 (1.34, 1.64)***
Agriculture	1174 (45.26)	36.24	Reference	Reference
Manual workers	779 (30.03)	34.64	1.87 (1.78, 1.96)***	0.95 (0.85, 1.06)
Health related factors				
Visited health facility in the last 6 months				
No	2160 (82.85)	83.13	Reference	Reference
Yes	447 (17.15)	16.87	1.09 (1.04, 1.14)***	1.09 (1.01, 1.18)*
Number of children who have died				
None	1956 (75.03)	78.58	Reference	Reference
One	485 (18.60)	16.97	1.34 (1.28, 1.40)***	1.37 (1.28, 1.47)***
Two and above	166 (6.37)	4.45	1.26 (1.17, 1.34)***	2.56 (2.29, 2.86)***
Total number of lifetime partner				
One	1801 (88.03)	91.59	Reference	Reference
Two and above	245 (11.97)	8.42	0.61 (0.56, 0.66)***	1.13 (0.99, 1.29)
Registered with NHIS				
No	951 (74.53)	75.31	Reference	Reference
Yes	325 (25.47)	24.69	0.97 (0.91, 1.02)	0.81 (0.76, 0.86)***
Ever being told of having hypertension				
No	2450 (93.98)	93.40	Reference	
Yes	157 (6.02)	6.60	4.83 (4.64, 5.02)***	3.86 (3.53, 4.21)***
Smokes cigarettes				
No	2388 (91.60)	93.53	Reference	
Yes	219 (8.40)	6.47	0.79 (0.73, 0.85)***	2.00 (1.81, 2.22)***

Table 3: Multilevel Poisson regression analyses predicting hypertension among men (Ghana Demographic Health Survey 2014) (N=2,607)

Covariates	Model 1	Model 2	Model 3
	Crude PRR (CI)	Adjusted PRR (CI)	Adjusted PRR (CI)
Socioeconomic status			
Wealth index			
Poorest	Reference	Reference	Reference
Poorer	1.11 (1.01, 1.21)*	0.90 (0.82, 0.98)*	1.30 (1.14, 1.48)***
Middle	1.85 (1.70, 2.01)***	1.91 (1.75, 2.07)***	2.01 (1.78, 2.27)***
Richer	2.36 (2.16, 2.58)***	2.13 (1.94, 2.33)***	2.61 (2.27, 3.00)***
Richest	2.33 (2.12, 2.55)***	2.17 (1.96, 2.40)***	2.92 (2.51, 3.39)***
Educational level			
No education	0.72 (0.65, 0.80)***	0.68 (0.61, 0.75)***	1.01 (0.87, 1.18)
Primary	0.91 (0.83, 1.00)	0.97 (0.89, 1.06)	1.14 (0.99, 1.30)
Secondary	1.33 (1.25, 1.42)***	1.23 (1.15, 1.31)***	1.05 (0.94, 1.17)
Higher	Reference	Reference	Reference
Occupation			
Professional/technical/managerial	1.07 (1.01, 1.14)*	1.35 (1.27, 1.44)***	2.27 (2.08, 2.47)***
Agriculture	Reference	Reference	Reference
Other manual workers	0.98 (0.92, 1.05)	1.26 (1.18, 1.34)***	1.23 (1.12, 1.36)***
Demographic factors			
Religion			
Orthodox	-	0.75 (0.67, 0.84)***	0.98 (0.85, 1.12)
Pentecostal/charismatic	-	0.72 (0.64, 0.80)***	1.02 (0.89, 1.17)
Other Christian	-	0.73 (0.65, 0.82)***	0.85 (0.72, 0.99)*
Islam	-	0.67 (0.60, 0.75)***	1.28 (1.10, 1.47)**
Traditional/spiritualist	-	Reference	Reference
No religion	-	0.78 (0.69, 0.89)***	0.77 (0.64, 0.92)**
Ethnicity			
Akan	-	1.02 (0.94, 1.11)	1.06 (0.89, 1.25)
Ga/dangme	-	0.93 (0.84, 1.03)	1.61 (1.34, 1.92)***
Ewe	-	0.70 (0.63, 0.78)***	0.66 (0.58, 0.80)***
Mole-dagbani	-	Reference	Reference
Gurma	-	1.17 (1.04, 1.32)***	0.69 (0.58, 0.81)***
Others	-	0.97 (0.88, 1.08)***	0.31 (0.25, 0.39)**
Region			
Western	-	1.12 (1.05, 1.20)**	1.40 (1.24, 1.57)***
Central	-	1.26 (1.15, 1.38)***	2.07 (1.86, 2.30)***
Greater Accra	-	Reference	Reference
Volta	-	1.56 (1.43, 1.69)***	3.25 (2.80, 3.76)***
Eastern	-	0.78 (0.73, 0.84)***	1.04 (0.92, 1.17)
Ashanti	-	1.08 (1.02, 1.16)*	2.75 (2.49, 3.03)***
Brong Ahafo	-	1.00 (0.92, 1.09)	0.99 (0.85, 1.16)
Northern	-	0.88 (0.79, 0.98)*	1.13 (0.91, 1.41)
Upper East	-	0.27 (0.24, 0.31)***	0.01 (0.16, 0.23)***
Upper West	-	0.95 (0.85, 1.06)	0.42 (0.32, 0.56)***
Age			
25-29	-	Reference	Reference
30-34	-	2.72 (2.40, 3.08)***	2.33 (1.84, 2.96)***
35-39	-	4.65 (4.13, 5.23)***	3.69 (2.92, 4.65)***
40-44	-	7.11 (6.31, 8.01)***	7.23 (5.71, 9.16)***
45-49	-	7.39 (6.58, 8.31)***	8.79 (6.98, 11.06)***
50-54	-	9.50 (8.39, 10.76)***	5.48 (4.25, 7.05)***
55-59	-	12.98 (11.64, 14.48)***	9.87 (8.10, 12.02)***
Health related factors			
Visited health facility in the last 6 months			
No	-	-	Reference
Yes	-	-	1.11 (1.04, 1.20)**
Number of children who have died			
None	-	-	Reference
One	-	-	1.12 (1.04, 1.21)**
Two and above	-	-	1.92 (1.71, 2.16)***

Total number of lifetime partner			
One	-	-	Reference
Two and above	-	-	0.93 (0.82, 1.05)
Registered with NHIS			
No	-	-	Reference
Yes	-	-	0.77 (0.72, 0.82)***
Told of having hypertension			
No	-	-	Reference
Yes	-	-	4.37 (4.06, 4.70)***
Smokes cigarettes			
No	-	-	Reference
Yes	-	-	2.22 (2.00, 2.47)***
Akaike Information Criterion (AIC)	1429	1365	526

Discussion

Prevalence of hypertension

This study identified several significant risk factors for hypertension among adult men in Ghana. These include wealth index, occupation, age, ethnicity, region, smoking and number of children who have died. Further studies are required to establish if indeed region and ethnicity are associated with hypertension as most of these risk factors would be expected. The findings indicate that hypertension is common among Ghanaian men. The high prevalence (8%) could be attributed to prehypertension in most individuals as estimated in a study conducted in the Ashanti Region of Ghana [15]. Prehypertension is associated with twice the risk of developing clinical hypertension compared with individuals with normal blood pressure [16]. Analysis of people without hypertension in the Framingham study showed that the incident rate of hypertension within 4 years of people with prehypertension is about 37% in those aged 35-64years and even higher (50%) in those above 64years [17].

Risk factors for hypertension

The risk factors for hypertension was based on model 3 results in table 3. Unadjusted analysis indicated that wealth index, educational level and occupation is significantly associated with hypertension. Upon adjusting for health-related variables, these remain significant with the exception of educational level. Wealth index is a significant predictor of hypertension. The higher the level of wealth index, the higher the risk of experiencing hypertension. For example, men belonging to the poorer level have 1.3 times the rate of developing hypertension compared to those who belonged to the poorest level whilst men who belonged to the richest level have 2.92 times the rate of developing hypertension compared to those at the poorer level. This is consistent with a study conducted by Moser and his colleagues which showed that high blood pressure increased steeply with increase in wealth [18]. This does not, however, mean that hypertension is suffered only by the affluence in society [19] but unfortunately most wealthy people engage in lifestyles such as lack of physical exercise due to availability of vehicles to transport them for short distances. In addition, low physical activity was reported in most hypertensive in a study conducted in Kenya [20].

Another significant predictor of hypertension is an individual's occupation. People whose occupation requires that they sit at one place for long time were 2.27 times more likely to develop hypertension compared to those who were engaged in agriculture. In agreement with several studies [21–23], our study confirms that occupations that are sedentary in nature increases an individual's risk of developing hypertension. Agriculture involves using physical energy to cultivate land and breed animals in order to provide food. Using physical energy results in burning of accumulated fats in the body and blood vessels which lowers one's risk of developing hypertension. However, those in managerial position as well as other office workers eat their usual meals but exercise very little which lead to accumulation of fats within their blood vessels and consequently increases their risks of developing hypertension.

This study also revealed that the ethnic group which people belonged to as well as the region where the study participants reside, predisposed them to developing hypertension or otherwise. Hypertension was less prevalent among ethnic groups in the northern parts of Ghana (Northern, Upper East and Upper West Regions) compared to the ethnic groups in the southern part (Central and Western Regions) of the country. For example, hypertension was 31% less prevalent among people belonging to Gurma ethnic group compared to those belonging to Ga/dangme. The northern parts of the country are considered the poorest regions in the country and majority of them are peasant farmers. As a result, they have a lower risk of developing hypertension. On the contrary, this cannot be said about the Ewes because they are located in southern part of Volta Region and also had hypertension being less prevalent among them. This can be explained with the fact that all the district in the region have young population [24] which protect them from developing hypertension.

This study like other studies [25–29] confirms age as an important predictor of hypertension. As population ages, the higher the risk of developing hypertension. Men aged 30-34 years have 2.33 times the rate of developing hypertension compared to those aged 25-29 years. Similarly, men aged 55-59 years have 9.87 times the rate developing hypertension compared to those aged 25-29 years. As the age of the population increases, it is likely that those in the pre-hypertensive stage will progress to develop full clinical hypertension if measures are not taken to curb the prevalence pre-hypertension.

Visiting health facilities regularly, health status awareness and registering with the National Health Insurance Scheme (NHIS) are health-seeking behaviours associated with hypertension. This study suggests that hypertension is 11% more prevalent among men who visited health facility for check-up within the last 6 months. This could be due to the fact that some of the men (6%) were aware that they are hypertensive hence visited health facility for treatment. Hypertension is 23% less prevalent among those registered with the NHIS. Men who are registered with NHIS are more likely to visit health facility on a regular basis for check-up and by so doing, pre-hypertension can be picked up and treated to avoid progression to full clinical hypertension.

Death of children has been found to be associated with hypertension. Hypertension is more prevalent (92%) among parents who lost two or more children compared to those who lost none of their children. Death has negative emotional effect on individuals who have lost their relatives especially those who do not believe in life after death. They grief in a manner indicating that they have lost those relatives forever. A study conducted by Krause and his colleagues in Japan has revealed that older adults who have experienced death of a loved one but do not believe in life after death were more likely to report they had

hypertension after a follow-up interview [30]. In as much as human being cannot stop death from occurring, bereaved families should be taken through a series of emotional therapy to reduce the risk of developing hypertension.

Also, smoking has been found to be a significant predictor of hypertension. Smokers have 2.22 times the rate of developing hypertension compared to non-smokers. Due to the toxic effects of carbon monoxide, smokers tend to develop a stable hypertension, however, this is masked by the combined effect of nicotine and carbon monoxide [31,32].

Conclusion

Hypertension is high among Ghanaian men. Wealth index is a significant predictor of hypertension. Men who belonged to the richest level have higher rate of developing hypertension compared to those at the poorer level. After adjusting for other covariates, an individual's occupations as well as the ethnic group that an individual belong to were found to be associated with hypertension.

Also, age and smoking were confirmed to be a significant predictors of hypertension after adjusting for potential covariates. Loss of children, number of life time partners and visiting health facility regularly were all found to be associated with hypertension.

Strength and Limitation of the study

Measuring the blood pressure of the study participant on the field without relying on their previous blood pressure status is one of the strength of the study. However, there are some limitations of the study, these include the following:

First, just as other cross sectional studies, respondents may give socially desirable answers which may lead to underestimation or overestimation of the effects of the variables on the status of hypertension.

Second, the study is prone to recall bias. Study participants were required to recollect events that happened some years preceding the study. This may lead to inaccurate reporting of events that happened during the period especially if the respondents have problems with their memory.

Recommendation

Based on the results from the analysis, the following recommendations are made:

1.Health promoters should make men aware that despite the responsibilities placed on them to ensure the upkeep of the home, they should make conscious effort to go for medical check-up at least twice a year.

2.More geriatric health professionals should be trained to take care of the aged in the community.

3.Health promoters should encourage men to acquire standard blood pressure apparatus on their own and be trained on how to use them.

Declarations

Ethical approval and consent to participate

Ethical approval for the Ghana Demographic and Health Survey (GDHS) was obtained from the Unites States Agency for International Development (USAID). The current paper analysed a secondary data from GDHS. The data is publicly available. A formal request for the use of the dataset was approved and granted to the authors by the USAID.

Availability of data and material

The datasets generated and/or analysed during the current study are available in the World Bank data catalogue, https://microdata.worldbank.org/index.php/catalog/3103/get-microdata

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MKD conceptualized the study. MKD and BK on behalf of the other authors obtained permission and MKD led the data extraction. MKD and BK formulated the study design, data analysis, results interpretations, and manuscript preparations. MKD drafted the manuscript according to the journal specifications. IA and AAB provided inputs in study design, data analysis, results interpretation and manuscript drafting. All authors critically reviewed drafts of the manuscript and approved its final version.

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